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CASE REPORT

BEGINNER

CLINICAL CASE

Optical Coherence Tomography Facilitating Early Withdrawal of Antiplatelet Agents in a High–Bleeding Risk Patient

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ABSTRACT

Optical coherence tomography (OCT) can guide percutaneous coronary interventions to optimize results, thus minimizing the risk of stent thrombosis. We present the case of a cancer patient, paroxysmal atrial fibrillation, and unstable angina who underwent OCT-guided complex percutaneous coronary intervention and who required early discontinuation of antiplatelet therapy because of major bleeding. (**Level of Difficulty: Beginner.**) (J Am Coll Cardiol Case Rep 2020;2:1186–91)

HISTORY OF PRESENTATION

An 82-year-old man was referred to our hospital (Ioannina University Hospital, Ioannina, Greece) for investigation of dyspnea on low effort and chest discomfort for the past 5 days (angina equivalent). On physical examination, he was normotensive, in sinus rhythm (55 beats/min), and with normal lung and heart sounds and no peripheral edema.

LEARNING OBJECTIVES

- Patients with multiple comorbidities, including cancer and atrial fibrillation, who undergo complex multivessel PCI, create a challenging clinical setting for optimal combined antiplatelet and antithrombotic therapy.
- Given the high bleeding risk in these patients, optimizing short-term PCI results by using advanced imaging techniques, such as OCT, may reduce the risk of future coronary thrombotic events and allow early discontinuation of antiplatelet drugs, thus limiting bleeding complications.

PAST MEDICAL HISTORY

The patient had an active lifestyle until recently, when he received a diagnosis of colon cancer (moderately differentiated adenocarcinoma). He underwent right hemicolectomy 3 months ago, and chemotherapy (5-fluorouracil, oxaliplatin, and leucovorin) was initiated. Two months later, hepatic metastases were detected. He also had a history of paroxysmal atrial fibrillation treated with apixaban, 5 mg twice daily, and a beta-blocker.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis comprised pulmonary embolism, chemotherapy-induced cardiomyopathy, and unstable angina.

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INVESTIGATIONS

The electrocardiogram demonstrated poor R-wave progress in leads V_2 to V_4. Blood tests revealed anemia (hemoglobin, 9.9 g/dl; normal range 13.5 to 17.5 g/dl) and mild elevation of D-dimers (0.7 mg/dl; normal range 0 to 0.5 g/dl). The troponin value was normal. The echocardiogram was negative for wall motion abnormalities or other remarkable findings; ejection fraction was slightly decreased (50% to 55%). Although the Wells score (= 1) was low, pulmonary embolism was excluded with computed tomography pulmonary angiography. Finally, a coronary angiogram was performed, revealing 3-vessel coronary artery disease with severe stenoses in the proximal and distal left anterior descending coronary artery (LAD) and the proximal left circumflex coronary artery (LCx), and moderate stenosis (>50%) in the proximal right coronary artery (Figures 1A to 1D).

MANAGEMENT

Therapy for unstable angina with aspirin, clopidogrel, a statin, an angiotensin-converting enzyme inhibitor, and transcutaneous nitrates was initiated. Apixaban had already been substituted for enoxaparin. An oncological consultation suggested that we proceed with the necessary revascularization, even though the patient could possibly require multiple hepatic operations in the future. Despite the low surgical risk (European System for Cardiac Operative

ABBREVIATIONS AND ACRONYMS

DK = double-kissing

DOAC = direct oral anticoagulant

LAD = left anterior descending coronary artery

LCx = left circumflex coronary artery

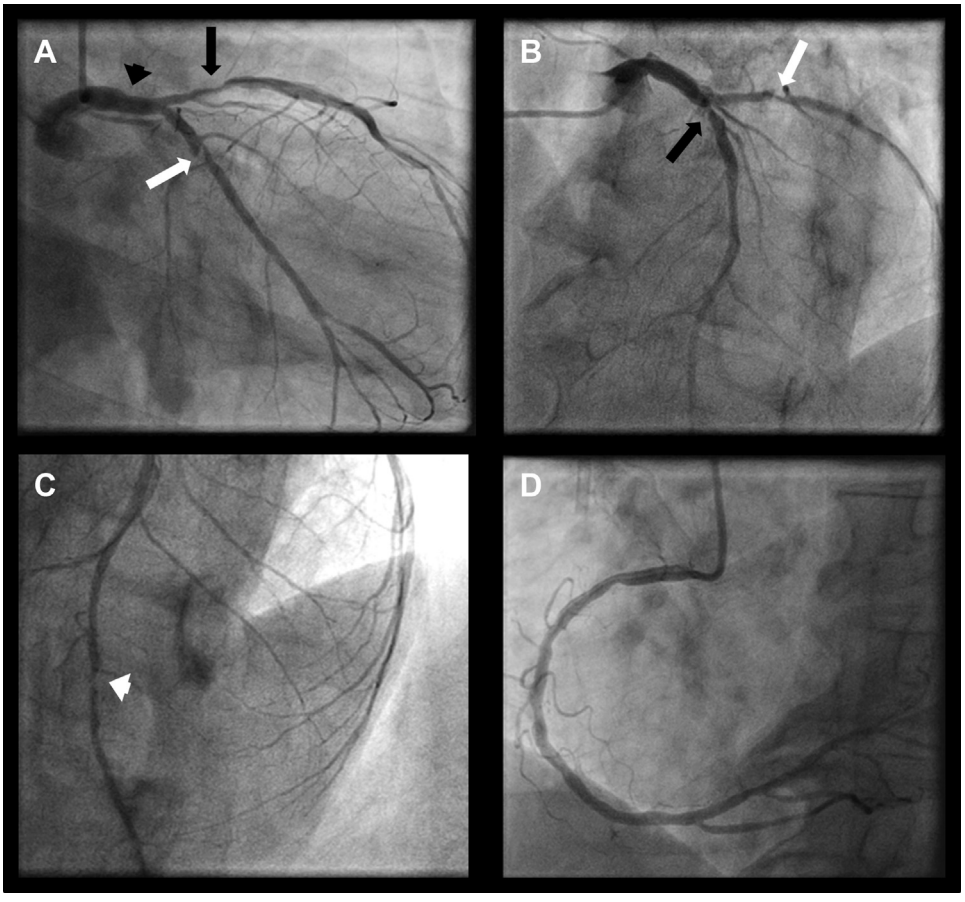
LM = left main coronary artery

OAC = oral anticoagulant agent

OCT = optical coherence tomography

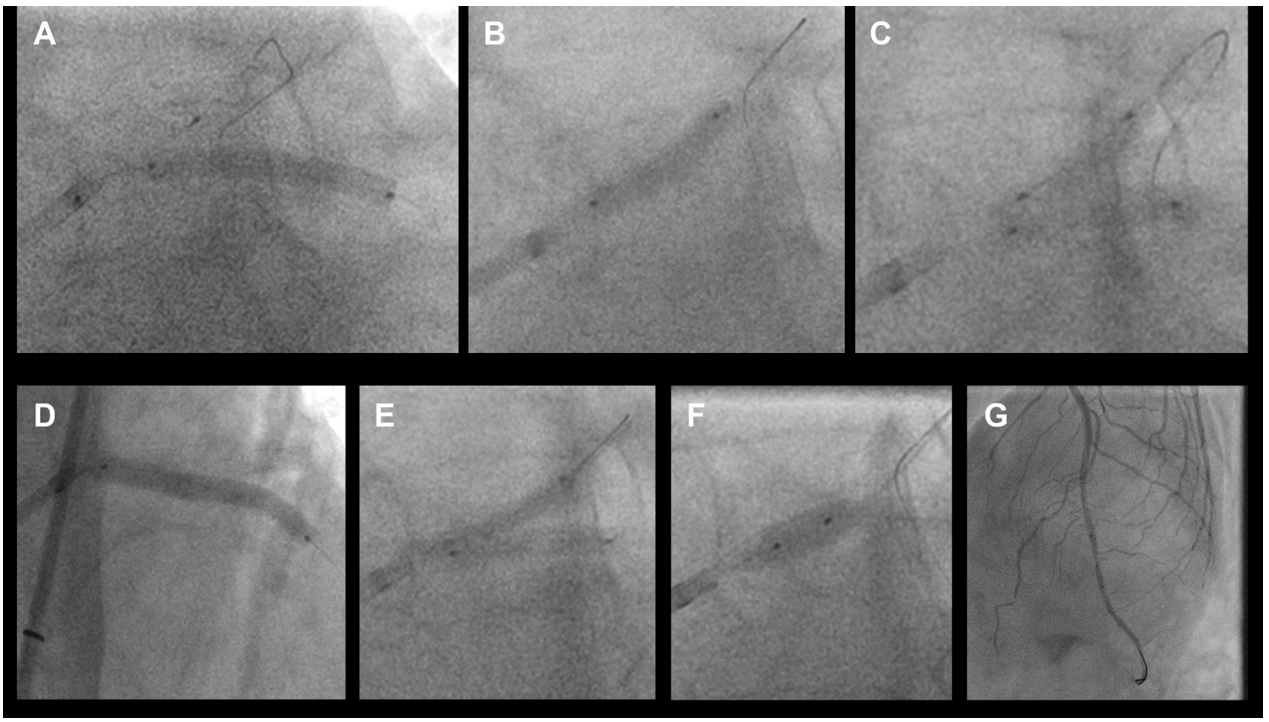
PCI = percutaneous coronary intervention

FIGURE 1 Initial Coronary Angiography



(A to C) Coronary angiogram shows atheromatic plaque in the left main coronary artery **(black arrowhead)**, a complicated severe lesion in the proximal left circumflex coronary artery (LCx) **(white arrow),** and severe stenoses in the proximal **(black arrows)** and distal **(white arrowhead)** left anterior descending coronary artery. **(D)** Moderate lesion >50% proximal in the right coronary artery.

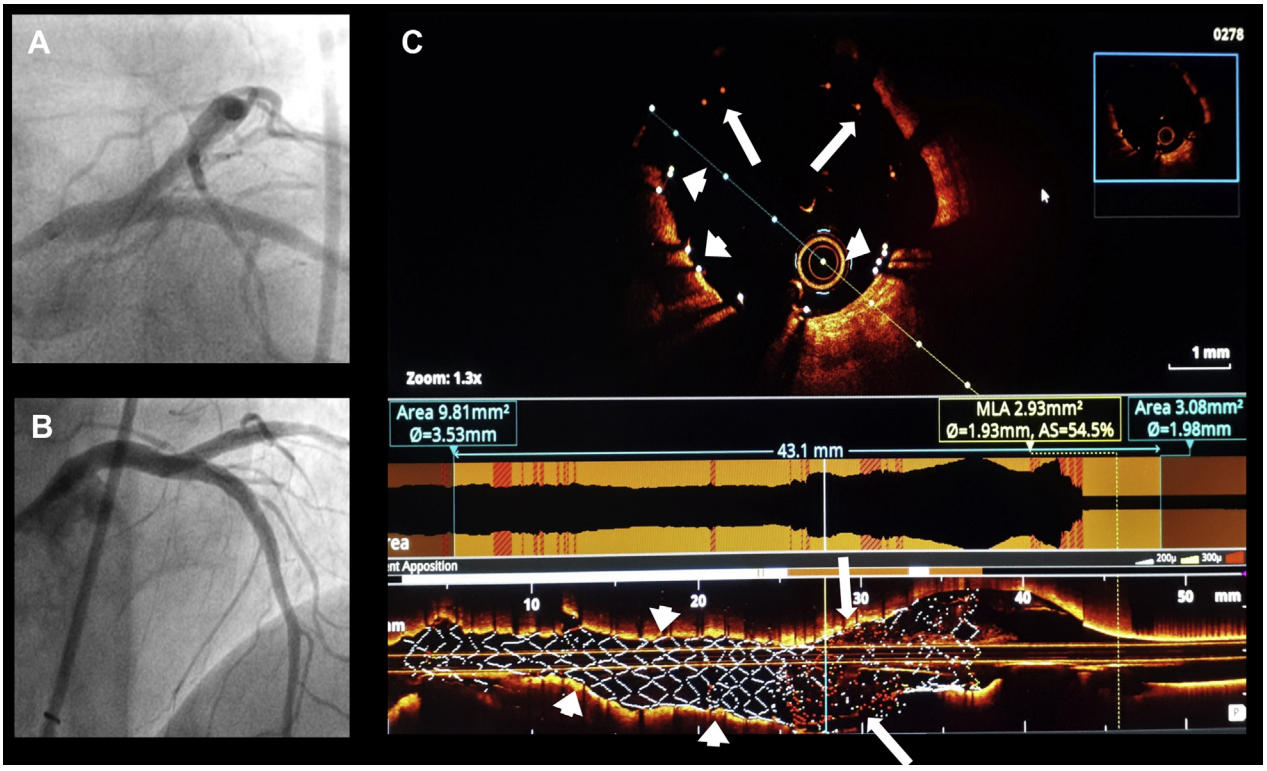
FIGURE 2 Double-Kissing Crush PCI in LM Bifurcation



(A) After initial pre-dilatations, a 3.5 × 2 6 mm drug-eluting stent was placed in the left circumflex coronary artery and **(B)** was crushed into the left main coronary artery (LM). **(C)** First kissing balloon and **(D)** implantation of a 3.5 × 34 mm drug-eluting stent from the left anterior descending coronary artery toward the left main coronary artery shaft. **(E)** Both stents were post-dilated with 3.5 × 8 mm noncompliant balloons, and a second kissing balloon was performed with 3.0 × 20 mm noncompliant balloons. **(F)** Final proximal optimization technique with a 4.5 × 8 mm noncompliant balloon. **(G)** A third drug-eluting stent, 2.5 × 12 mm, was implanted in the distal left anterior descending coronary artery. PCI = percutaneous coronary intervention.

Risk Evaluation [EuroSCORE] II, 1.72%; Society of Thoracic Surgeons [STS] score, 1.59% vs. SYNTAX score, 28), the heart team decided to forgo surgical revascularization in the light of the patient's active cancer. Therefore, we proceeded to perform a double-kissing (DK) crush percutaneous coronary intervention (PCI) technique in the left main coronary artery (LM) bifurcation. We used 2 drug-eluting stents placed under complete optical coherence tomography (OCT) guidance at every step of the procedure (sizing, distal and middle rewiring, proximal optimization technique) to achieve the best result possible. A DK-crush procedure was selected instead of provisional stenting to ensure complete LCx ostium coverage and patency, in case of plaque-shifting toward the LCx during LAD-LM stenting. A third drug-eluting stent was implanted at the distal lesion of the LAD (Figures 2A to 2G). After OCT imaging, significant numbers of stent struts were found to be malapposed, particularly in the LM (Figures 3A to 3C). The proximal optimization technique with a larger noncompliant balloon achieved complete strut apposition, which was confirmed with OCT (Figures 4A to 4C). The patient was discharged a few days later, completely relieved of symptoms. The following antithrombotic therapy was prescribed: dabigatran, 110 mg twice daily (CHA_2DS_2-VASc [congestive heart failure, hypertension, age ≥75 years, diabetes mellitus, prior stroke or transient ischemic attack or thromboembolism, vascular disease, age 65 to 74 years, and sex category female] score = 3); clopidogrel, 75 mg; and aspirin, 100 mg daily. Taking into consideration the patient's high bleeding risk (HAS-BLED [hypertension, abnormal renal/hepatic function, stroke, bleeding history, labile international normalized ratio, elderly >65 years of age, drugs/alcohol concomitantly] score = 3), along with the

FIGURE 3 Detection of Malapposed Stent Struts



(A and B) Despite good angiographic results, **(C)** optical coherence tomography imaging, using stent apposition software, detected a significant number of stent struts malapposed to the vessel wall **(red)**, especially in the left main coronary artery **(arrows)**; well-apposed struts are **white (arrowheads)**.

OCT-optimized PCI, aspirin was discontinued after 1 week.

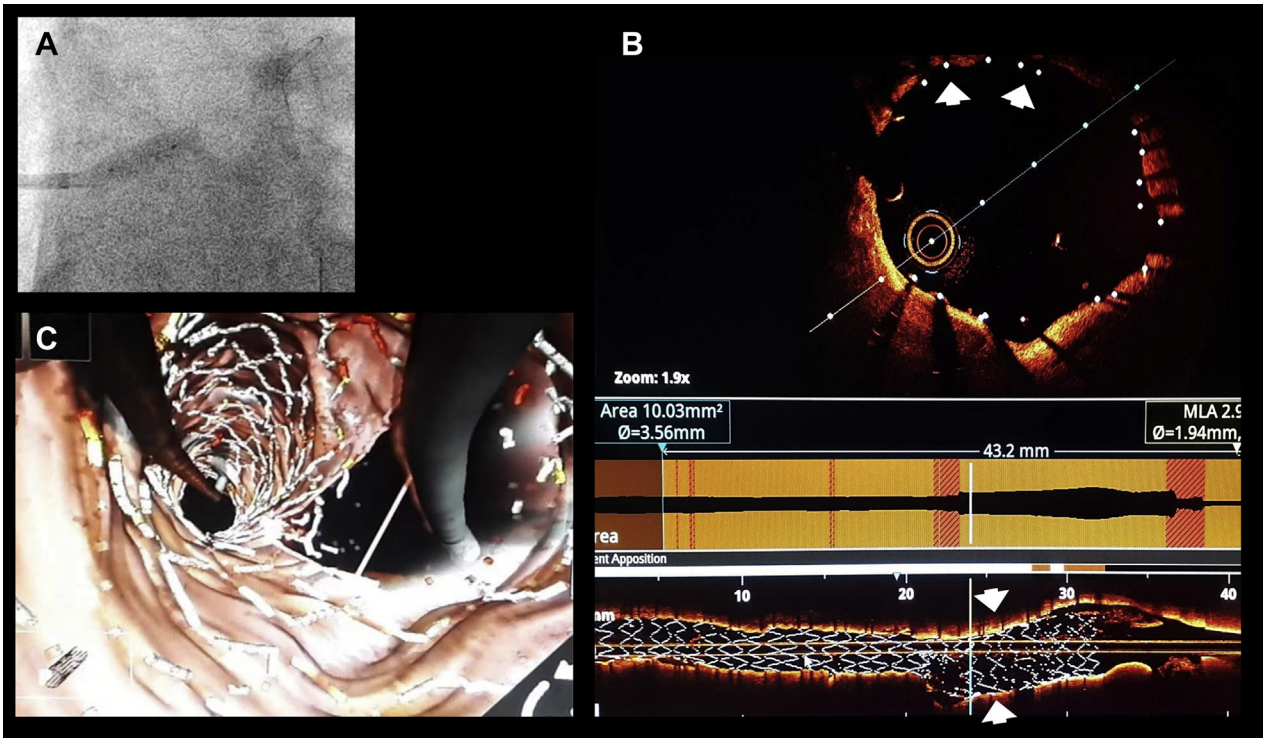
FOLLOW-UP

The patient continued his chemotherapy schedule, with subsequent regression of the hepatic metastatic lesions. Nevertheless, he had 2 episodes of major gastrointestinal bleeding that were attributed to a cecum ulcer at the level of the previous surgical anastomosis. The first episode was on day 40 post-PCI (while he was receiving dabigatran and clopidogrel; hematocrit, 18%; 5 U of red blood cells transfused). The second episode was 3.5 months after PCI (while taking dabigatran and clopidogrel; hematocrit, 20%; 4 U of red blood cells transfused), and, at that point, clopidogrel was permanently stopped. The decision for the early withdrawal of clopidogrel was once more supported by the satisfying angioplasty result, as confirmed by OCT, and the dose of dabigatran was titrated to 150 mg twice daily. On the latest scheduled follow-up (10 months after PCI), the patient was free of angina, without any further bleeding events. One month ago, the patient underwent partial hepatectomy without any hemorrhagic complications and with an uneventful recovery.

DISCUSSION

According to current guidelines, triple antithrombotic therapy with an oral anticoagulant agent (DOAC or OAC), aspirin, and clopidogrel is necessary for most patients with atrial fibrillation (provided the CHA_2DS_2-VASc score is ≥2, without discrimination between paroxysmal and other types of atrial fibrillation) and recent PCI. The duration of this triple regimen depends on several clinical and procedural factors reflecting the individual patient's ischemic and bleeding risk and usually ranges between 1 and 6 months (dual antiplatelet therapy should be confined to the periprocedural phase in patients at high bleeding risk and low ischemic risk). After this period, guidelines recommend discontinuation of aspirin or clopidogrel until

FIGURE 4 Appropriate Stent Strut Apposition



(A) After proximal optimization technique with a 5. 0 × 12 mm noncompliant balloon, **(B)** optical coherence tomography imaging confirmed good apposition of the previously malapposed struts in the left main coronary artery **(arrowheads)**. **(C)** A 3-dimensional reconstruction of the stented carina.

12 months after PCI. Beyond 12 months after PCI, DOAC or OAC monotherapy is indicated, with possible extension of single antiplatelet therapy when high-ischemic risk features prevail (1-3).

In the aforementioned group of patients, cancer patients constitute a special subgroup with additional thromboembolic, ischemic, and hemorrhagic risk. Cancer therapies themselves may promote or worsen myocardial ischemia, thrombosis, and atrial fibrillation. Current position papers do not shed much light on the optimal revascularization strategy or on the optimal antithrombotic regimen after PCI in such patients. Furthermore, with the exception of the STS score, widely used risk scores (EuroSCORE II, SYNTAX II, CHA_2DS_2-VASc, HAS-BLED) are not validated in cancer patients (4). The use of direct oral anticoagulant agents (DOACs) is considered relatively safe in cancer patients (5). Considering the high bleeding risk of our patient and the possible need for operations in the near future, immediate anticoagulant reversal with a DOAC antidote may be needed. Therefore, dabigatran was chosen as the best option because it is the only DOAC with a proven specific antidote—idarucizumab, a monoclonal antibody fragment that specifically binds to dabigatran and completely reverses its anticoagulant action (6).

Among several other characteristics (including acute coronary syndrome presentation and bifurcation lesions), stent underexpansion and malapposition are well recognized factors related to an increased risk of stent thrombosis (7). Intravascular imaging, either with intravascular ultrasound or OCT, is useful for detecting these conditions, hence guiding PCI procedures to better results. OCT, in particular, uses an optical fiber core and near-infrared light to produce a 10- to 20-μm level of resolution, thus enabling superior imaging of the intimal layer and stent struts (7,8). Finally, compared with other 2-stent techniques, the DK-crush technique seems to have the most favorable outcomes when treating unprotected LM bifurcation lesions (9). In the setting of this complex bifurcation lesion, we used the DK-crush technique with

OCT optimization, to achieve the best short- and long-term outcome for this patient with a complex case.

CONCLUSIONS

OCT imaging has an important role in optimizing stent apposition, especially after complex PCI procedures. Optimized PCI results could possibly facilitate the clinical decision of early withdrawal of antithrombotic agents in patients with subsequent major bleeding.

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KEY WORDS DOAC, high bleeding risk, optical coherence tomography, unprotected left main angioplasty